Marine Corps Systems Command

Tri-Service Power Exposition

July 16, 2003

Contents of Presentation

- Purpose, Mission & Players in USMC Power
- Programs and duties of the Program Manager for Expeditionary Power Systems
- Science and Technology Efforts
- Lessons Learned
- Business Opportunity Initiatives
- Points of Contact

Target Audiences

- **Fleet Marine Forces & Reserves**
- **Industry participants**
- **Other Services**

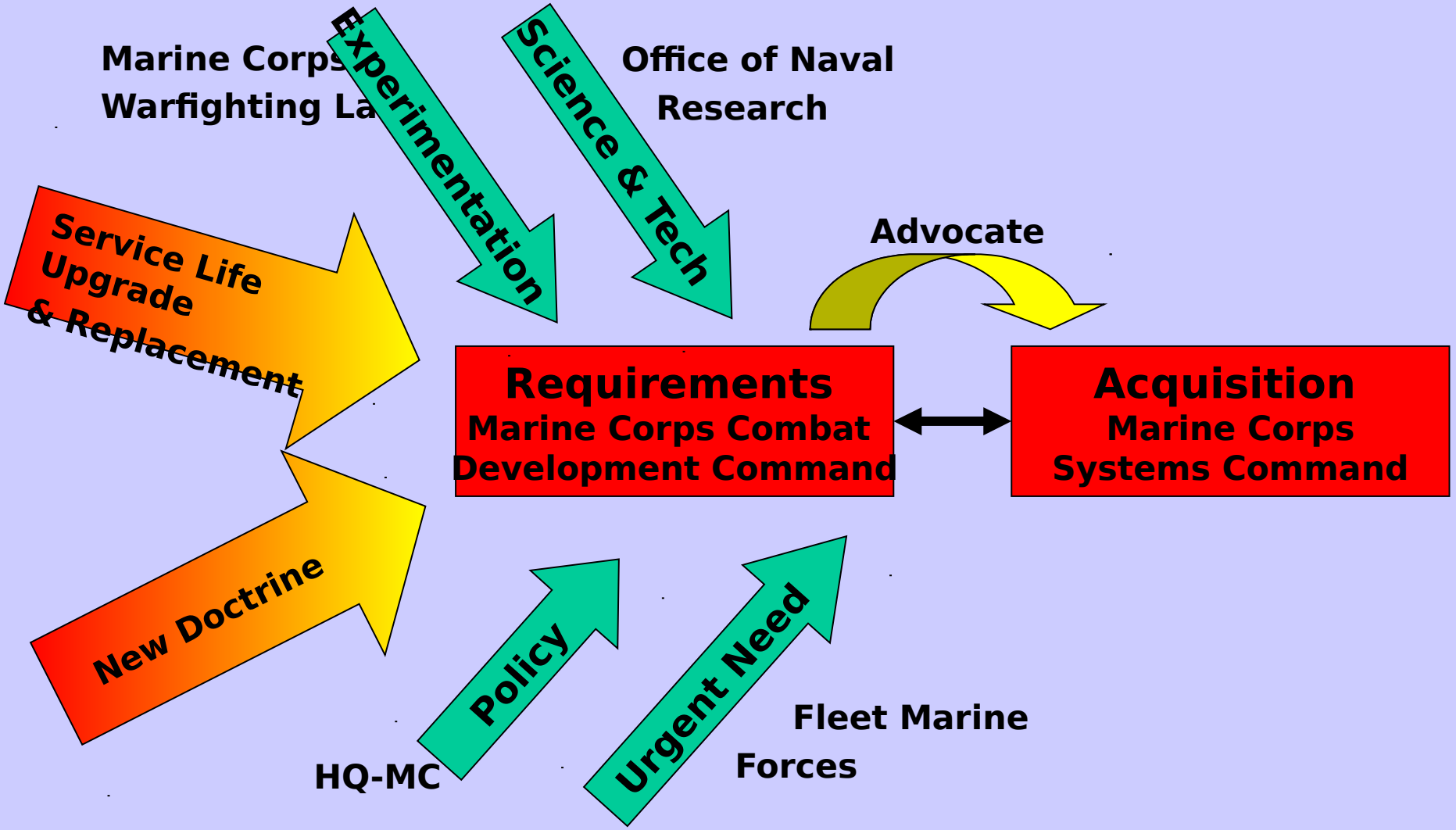
1947 National Security Act

- **Provide Fleet Marine Forces with combined arms and supporting air components for service with the United States Fleet in the seizures or defense of advanced naval bases and for the conduct of such land operations as may be essential to the execution of a Naval campaign.**

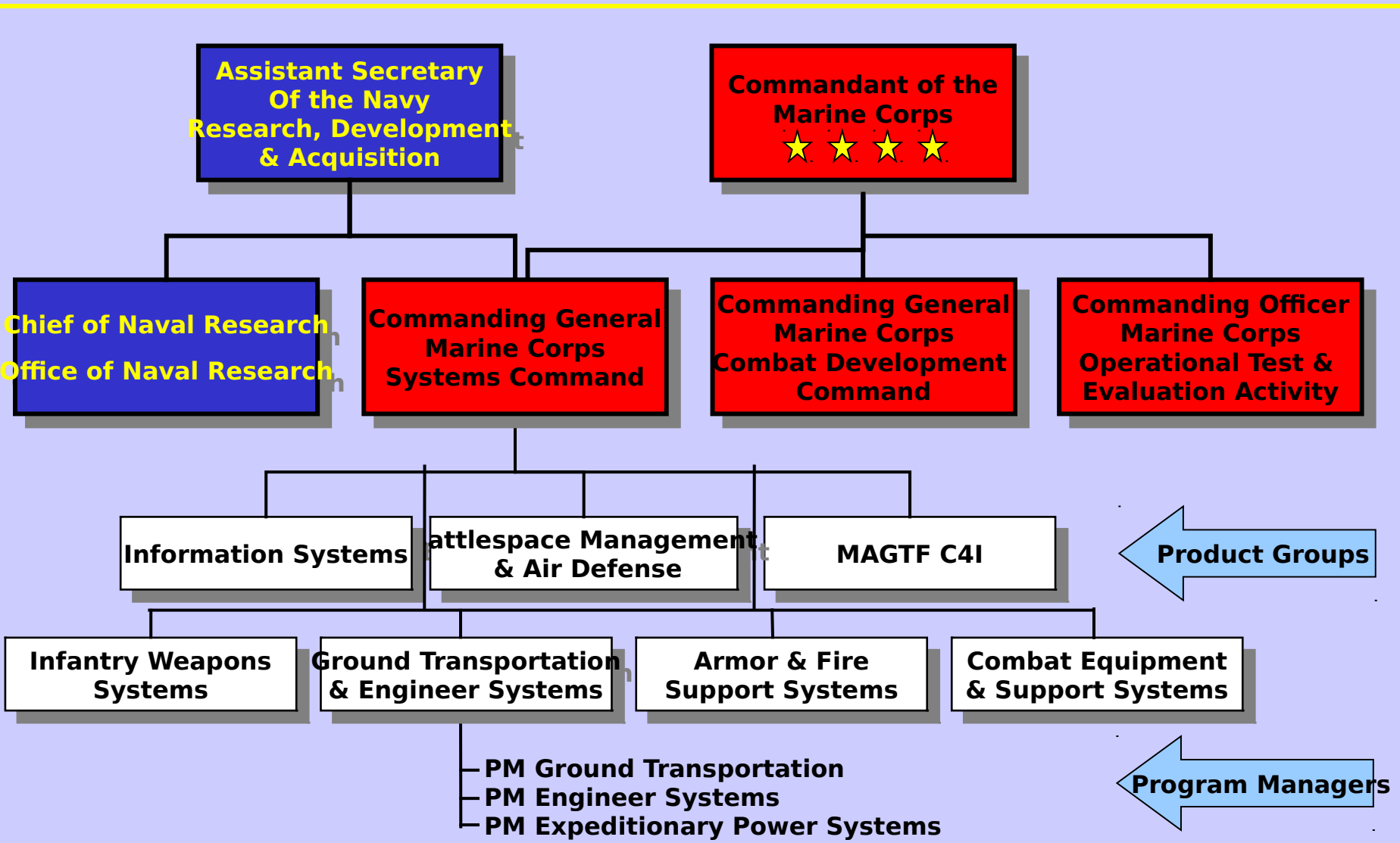
- **Develop, in coordination with the Army, Navy and Air Force, the doctrine, tactics, techniques, and equipment employed by landing forces in amphibious operations.**

- **Develop in coordination with the Army, Navy and Air Force the doctrine , procedures and equipment for airborne operations.**

Key Players of Acquisition



USMC Acquisition

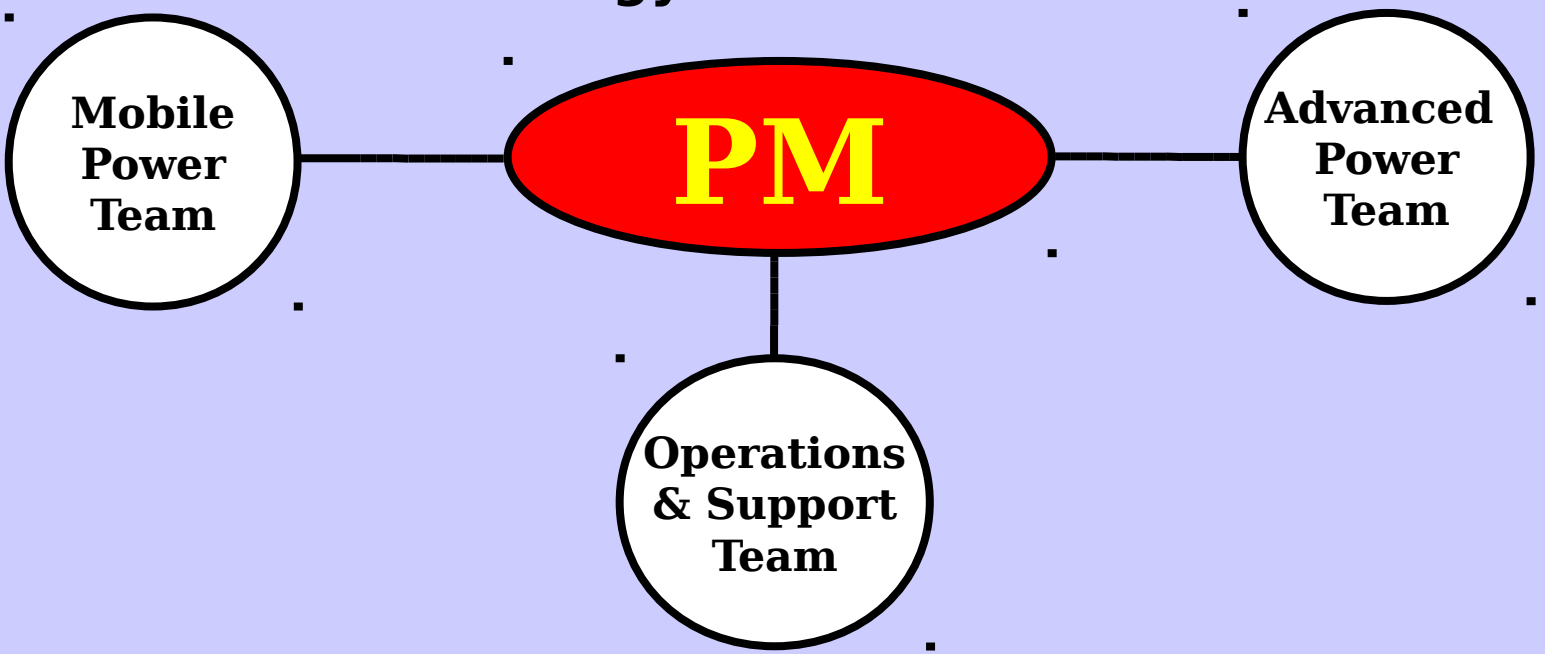

Assistant Secretary Of the Navy Research, Development & Acquisition
Commandant of the Marine Corps
Chief of Naval Research
Office of Naval Research
Commanding General Marine Corps Systems Command
Commanding General Marine Corps Combat Development Command
Commanding Officer Marine Corps Operational Test & Evaluation Activity
Information Systems
Battlespace Management & Air Defense
MAGTF C4I
Product Groups
Infantry Weapons Systems
Ground Transportation & Engineer Systems
Armor & Fire Support Systems
Combat Equipment & Support Systems
PM Ground Transportation
PM Engineer Systems
PM Expeditionary Power Systems
Program Managers

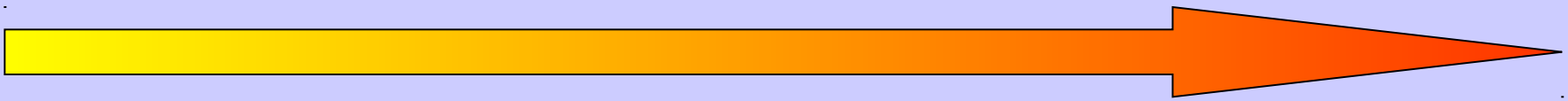
USMC Program Managers

	Program Management Team	PM Code
Information Systems PG 10	Combat Support Information Systems	PMM 101
	Navy-Marine Corps Intranet / Information Technology PMM 102	
Battle Management & Air Defense - PG 11	Operation Centers	PMM 111
	Radar Systems	PMM 112
	Air Defense Weapon Systems	PMM 113
MAGTF C4I Systems PG 12	Ground Command & Control Systems	PMM 121
	Communications Systems	PMM 122
	Intelligence Systems	PMM 123
Infantry Weapons Systems - PG 13	Recon & Amphibious Raids	PMM 131
	Infantry Weapons	PMM 132
	Anti-Armor Systems	PMM 133
Armor and Fire Support - PG 14	Fire Support Systems PMM 141	
	Tank Systems	PMM 142
	Assault Amphibious Vehicle Systems PMM 143	
Ground Transportation & Engineer Systems - PG 15	High Mobility Artillery Rocket System - HIMARS PMM 144	
Combat Equipment & Support Systems - PG 16	Ground Transportation PMM 151	
	Engineer Systems	PMM 152
	Expeditionary Power Systems	PMM 153
	Test, Measurement, & Diagnostic Equipment	

Mission & Roles

Mission: “Provide for the acquisition and lifecycle management of assigned programs, explore alternative power source technology”.





Mobile Power Team

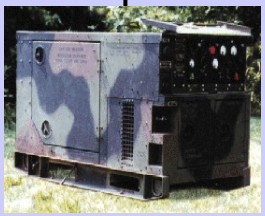
- Family of Power Equipment
  - Roll up for 15 different power items
  - Generator sets from 3kW to 100kW
  - Continuous buy effort for TQGs
  - Power Distribution sets, Field wiring, load banks
  - No longer support / train for Mil-Std Generators
- Discrete Programs
  - Floodlight Sets
  - Non-Standard Generators

Mobile Electric Power

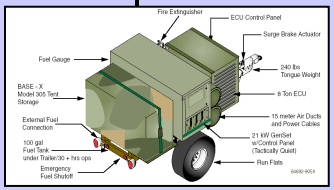
Generation

Distribution

2 kW MTG
(evaluation)



10 kW TQG



21 kW UOC

60 kW TQG

15, 30, & 100 kW
PDS

5 kW PDS
(war effort)

3 kW TQG

Urgent Need for War
15 kW Commercial

30 kW TQG

100 kW TQG

Supported Generators

3 kW, 60 Hz MEP Model 831A

10 kW, 60 Hz MEP Model 803A

10 kW, 400 Hz MEP Model 813A

30 kW, 60 Hz MEP Model 805A/B

30 kW, 400 Hz MEP Model 815A/B

60 kW, 60 Hz MEP Model 806A/B

Pending Generators

2 kW, 60 Hz **MEP Model 531A**

2 kW, 28 VDC **MEP Model 501A**

5 kW, 60 Hz **MEP Model 802A**

15 kW, 60 Hz **MEP Model 804A**

100 kW, 60 Hz **MEP Model**

100 kW Tactical Quiet Generator

Technical Performance

The 100 kW TQG is being acquired to satisfy a requirement to replace the current 100 kW Military Standard Generators. This acquisition will produce generators that are comparable to other tactical quiet generators in the DOD family of generators. It will weigh less, be multi-fuel capable, provide reduced audible and infrared signatures, provide improved reliability, and reduce O&M costs. The USMC will procure the unit in a skid-mounted configuration.

Vendor

Integration: Fermont

Engine: Caterpillar

EPA Certified

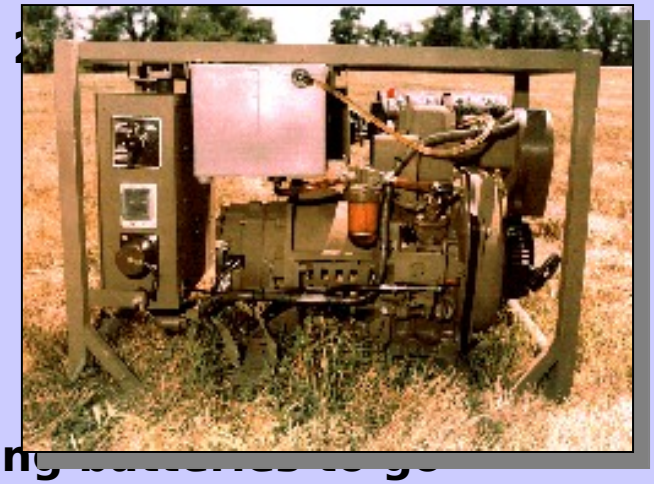
Model: MEP- 807A

Start: 2006/2007

Qty: >200

Users: MTACS

MEP 531 Generator (2 kW)



- 10 month loan to MEU Service Support Group 2
- Deployed with Landing Force 5th/6th Fleet
- Used in Kosovo, Djibouti, Kenya, U.A.E, Iraq
- Noted benefits and likes:
  - 2-man portable
  - Easy to operate
  - Pull started or slave started (like not having batteries to go dead)
  - Anti-wetstacking device
  - Electric refueler (refuel itself from a 5-gallon can)
- Desires/Dislikes:
  - Needs an improved muffler system (too noisy)
  - Would like a protective case for embarkation purposes
  - To store generator and accommodate anticipated SL-3 / SL-4 items
- "Give it fuel and it just keeps on running"

Floodlight Replacement

More Discussion Under Business Opportunities

Technical/Performance

- Self-contained system
- Diesel / JP-8 power plant
- At least eight hours of continuous operatio
- Light tower
  - Extendable to a height of 30 feet, 360° sw
  - >300,000 lumens
- Four remote-able tripod mounted lights
  - > 2,000 lumens each
- Weigh less than 2,000 pounds
- External helo transportable
- Skid-mounted (wheeled units being reasse
- Trailer mounted to M116A3 and M353 traile
- Quantity of Buy: 652 (excluding test units)

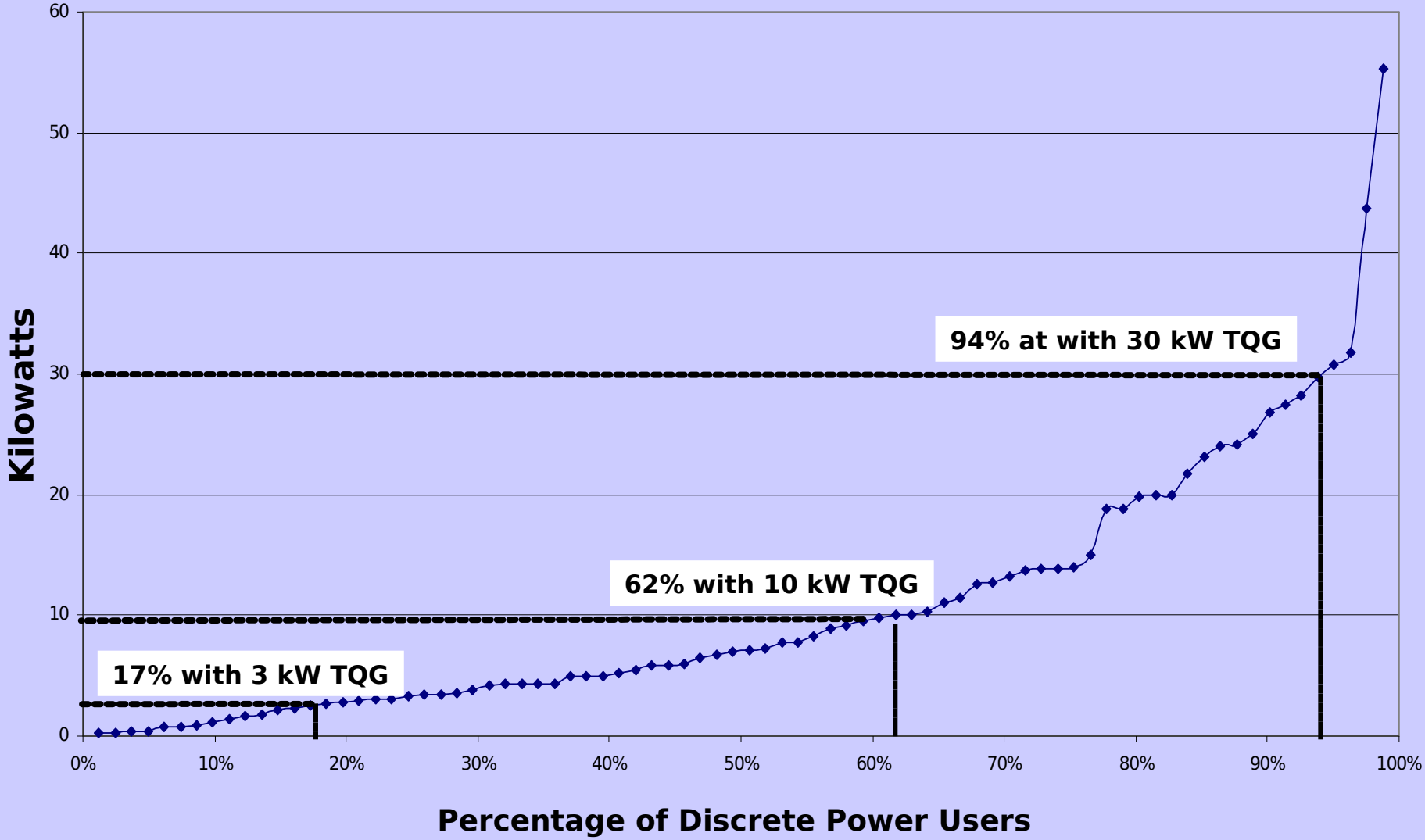
Non-Standard Generators

- DOD Instruction 4130 addresses non-standard generators
- Joint Operating Procedure & Marine Corps Order institutes practice for ALL USMC activities
- Request for Deviation must be prepared and submitted to PM-MEP for waiver
- Program Manager – Expeditionary Power Systems is USMC Central Control Point (prior to going to PM MEP)
- HQ, MCCDC, and MCSC fully support the policy
- Request for Deviation should be started prior to development and acquisition
- Acquisition Reform does not alleviate this responsibility

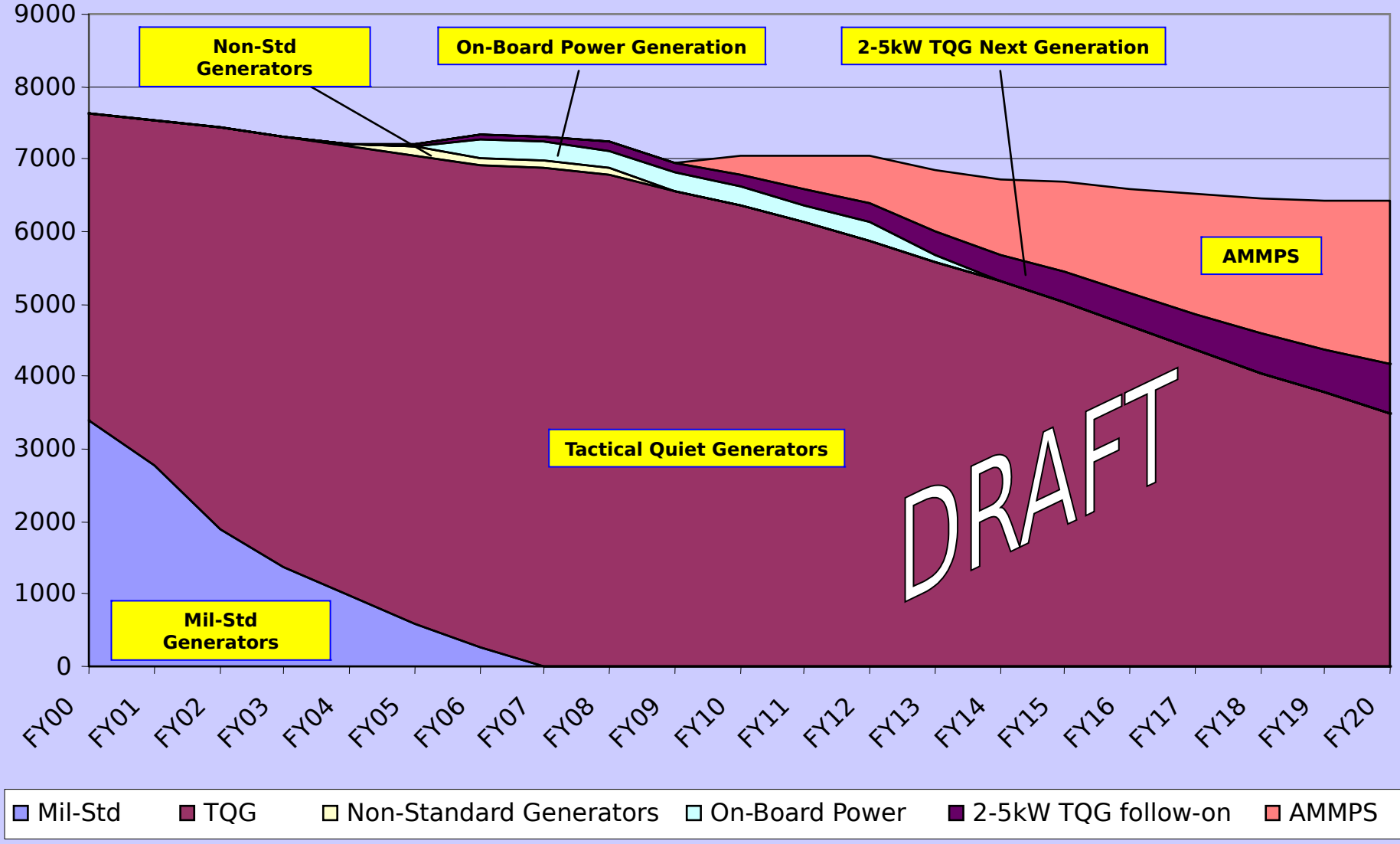
Mobile Electric Power Study

- **Issues:**
  - **Are we buying right type / right quantity of generators**
  - **What are our future power needs**
  - **Address those issues we can can have impact upon**
- **Approach**
  - **Identify Programs across Future Years Defense Plan**
    - **Task Completed**
  - **Tabulate and synthesize data / search from trends and issues**
    - **Stationary / On-the-move power**
    - **Steady state / Peak power**
    - **Precise / Utility power**
    - **50/60 Hz, 60 Hz, 400 Hz**
  - **Address power on-hand at FMF / Reserves**

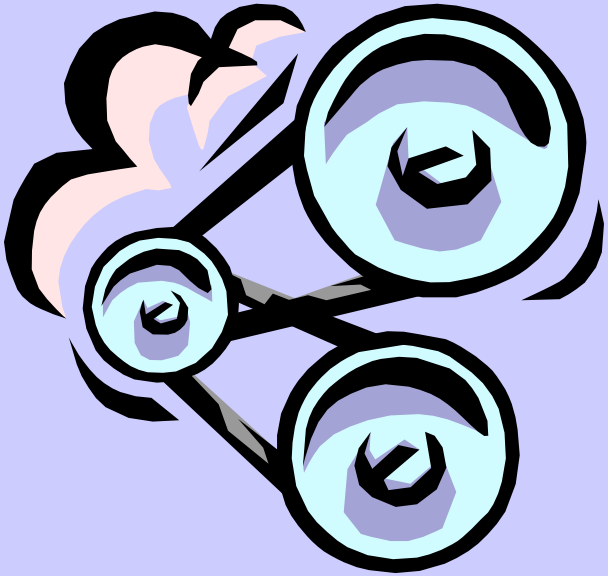
Marine Expeditionary Unit Power inventory



Notional Future Power Mix

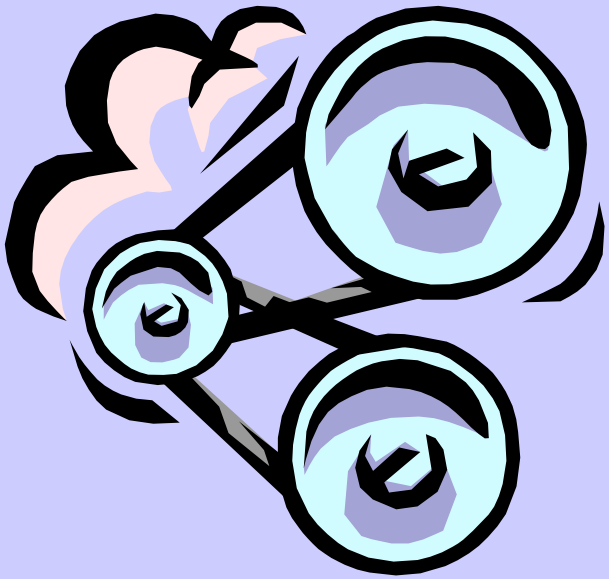


Advanced Medium Sized Mobile Power Sources (AMMPS)



- Third generation of military tactical generators
- PM-MEP is lead / USMC will be portion of the buy
- Will replace ALPHA & BRAVO series TQGs
  - Addresses 5kW to 60 kW
  - 3 kW TQG will stay in production until 2010
- USMC planned fielding for AMMPS to start in 2010

Advanced Medium Sized Mobile Power Sources (AMMPS)



- Diesel / JP-8 power plant
- Technology assessments looked at:
  - Fuel Cells, turbines, solar, thermo-photovoltaic
  - Will be electronically controlled, reciprocating engine
- Improvements over current TQGs:
  - 15 – 50 % Smaller
  - 15 – 50 % Lighter (fleet and individually)
  - 15 – 50 % More Fuel Efficient
  - 5 – 10 dBA Quieter
  - 20 – 50 % More Reliable
  - EPA Compliant
- Skid & Trailer mounted (Army / USMC differ)
- Army will field with a 2-Level Maintenance
- USMC will have to assess / adjust if need-be

Advanced Power Team

- Advanced Power Systems for Communication Equipment (APSCE)
  - Power Adaptors
  - Solar
  - Fuel Cells
- Tactical Power supplies
- Batteries
  - Battery Management & Sustainment Systems
  - USMC Technical POC
  - Safety certification clearing-house
  - HAWKER Absorbed Glass Mat
- Science and Technology Efforts
  - Hybrid Electric Vehicles
  - Under-hood power
  - Fuel Cell demonstration

ALTERNATIVE POWER SOURCES FOR COMMUNICATIONS EQUIPMENT (APSCE)

Suite of devices used to:

- Power C4I equipment
- Realize cost avoidance
- Reduce logistics burden
- Reduce battery use
- Commercial off-the-shelf items

Testing:

- Mil-Std-810 and Mil-PRF-28800 evaluation for all acquisitions

First Technology Increment:

- SINCGARS Power Adapters
- Objective: ~4700 end items
- Fielding: FY03 - FY05

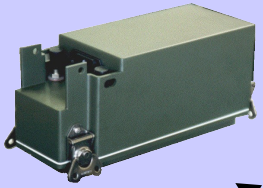
Follow-On Technologies:

- Radio Power Adaptors
- Power Converters
- Battery Management Systems
- Solar power chargers & adaptors
- Fuel Cells

ALTERNATIVE POWER SOURCES FOR COMMUNICATIONS EQUIPMENT (APSCE)

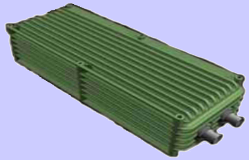
Multi-SINCGARS Power Adaptor

Single SINCGARS Power Adaptor



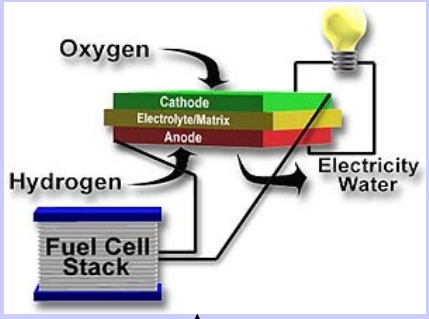
Radio Power Adaptors

Power Converters



Solar Power

Fuel Cells



FY02 **FY03** **FY04** **FY05** **FY06** **FY07**

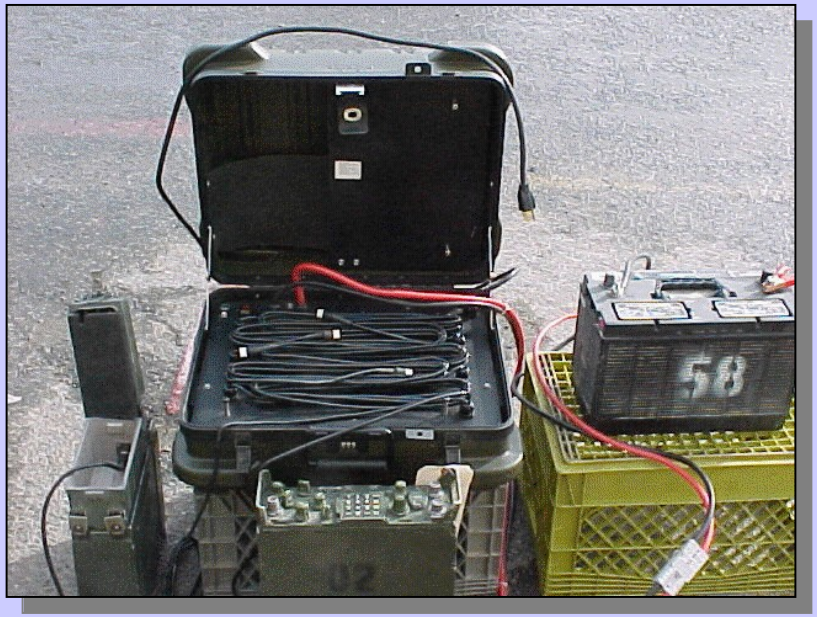
SINCGARS Power Adapters

- **USMC Name: Multi-SINCGARS Power Adapter (MSPA)**
- **Vendor Name: Advanced SINCGARS Alternative Power Supply**
- **Nicknames: ASAPS-6 / MSPA**
- **Energizes up to 6 SINCGARS radios**
- **Input: 110 VAC or 12 VDC**
- **UPS capable if both power sources are connected**
- **Each ASAP-6 receives transport case**
- **ULSS 003702, 15 December 2002**
- **TAMCN H7715**

REMINDER:

Direct Vendor Delivery, Acknowledgement of Receipt Required

SINCGARS Power Adapters



REMINDER:

Direct Vendor Delivery, Acknowledgement of Receipt Required

- **USMC Name: Multi-Radio Power Adapter**
- **Vendor Name: Advanced SINCGARS Alternative Power Supply - Suitcase**
- **Nicknames: ASAPS-SC / MRPA**
- **Energizes a up to 6 SINCGARS**
- **UPS capable if both power sources are connected**
- **Input: 110 VAC or 12 VDC**
- **DRAFT ULSS 000503-15**
- **TAMCN H7705**

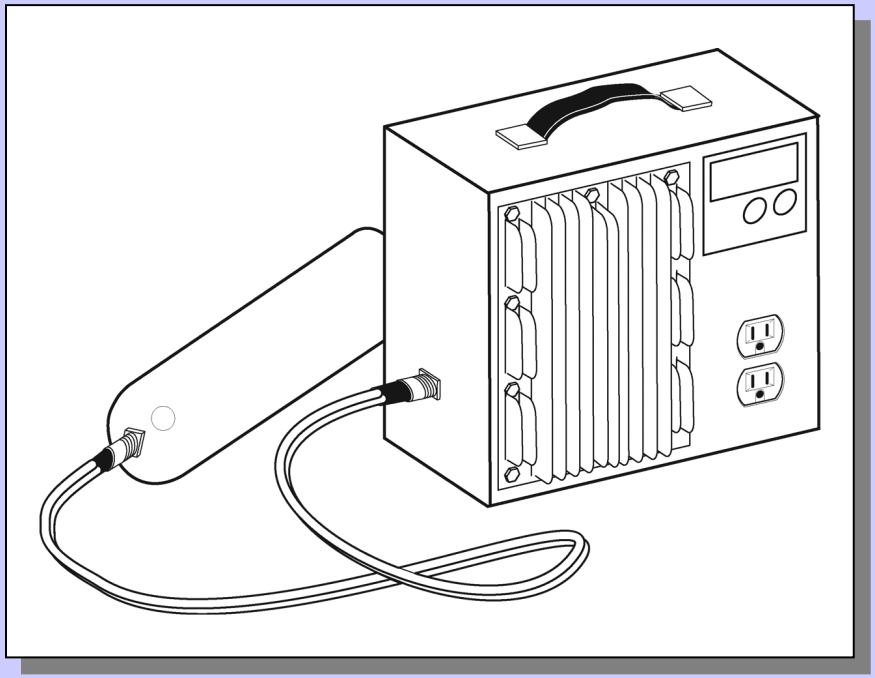
SINCGARS Power Adapters

REMINDER:

Direct Vendor Delivery, Acknowledgement of Receipt Required

- **USMC Name: SINCGARS Single Power Adapter (SSPA)**
- **Vendor Name: PAC-216/U**
- **Energize a Single 12 volt SINCGARS**
- **Has an Uninterruptible Power Supply**
  - **Internal sealed lead acid rechargeable battery**
  - **Internal charging system included**
- **Input: 110 VAC**
- **DRAFT ULSS 003202-15**
- **TAMCN H7710**

USMC Fuel Cell Efforts



- Requirement under APSCE
- Alternative to Batteries
- Past Experimentation
- On-Going / Future Efforts
- Cooperative Efforts

Detailed Discussion Under Fuel Cell Session

Battery Efforts

- Battery Management and Sustainment Program
  - Battery Chargers
  - Rechargeable batteries
  - Navy Lithium Battery Safety Program
- Analyses
  - MCCDC Battery Study
  - HQ Battery Conservation Plan
- Evaluations
  - BA-8180 evaluation
  - HAWKER ArmSafe +
- Summary

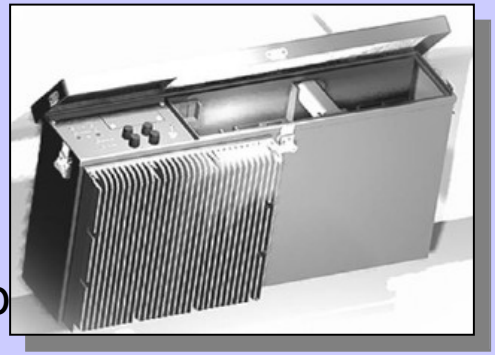
Battery Chargers

PP-8444 "Universal Portable Battery Charger"

- Can use AC or vehicle DC power
- Currently fielded

PP 8333/U "Battery Charger - Analyzer"

- AC power only
- Can charge numerous types



PP 8481/U Vehicle "Charger on the move"

- Mounts in vehicle, or used on bench-top
- Runs off AC or DC power
- Will be fielded by MARCORSYSCOM when $$ availab

PP 8498/U "Soldier Portable Charger"

- AC and DC power (only shipped with AC power cable
- Comes with one adaptor to charge two BB-390s/259
- Can plug in up to 8 batteries, charges only 2 at a tim
- Will be fielded by MARCORSYSCOM when $$ availab

Rechargeable Batteries

- **BB-390 Nickel Metal Hydride battery is still supported by the Army**
- **BB-490 Lead Acid battery is NO longer supported by the Army**
- **BB-590 Nickel Cadmium battery is NO longer supported by the Army**
- **BB-690 Lead Acid battery is NO longer supported by the Army**
- **BB-2590 Lithium Ion, available soon, is Not Approved for USMC use**
- **A7700 charger (PP-8333) - Not yet programmed for the BB-2590**

BA-5390 $LiMnO_2$ Battery

- **REF: MCSC 101842Z MAR 03**
- **BA-5390 APPROVED FOR MARINE CORPS USE <u>WITH SINCGARS ONLY</u>**
- Developed as an alternative to the BA-5590 lithium sulfur dioxide battery.
- Safety certification has been completed for use in SINCGARS radios.
- But only BA-5390 Safety Considerations
  - Has a 16.5 VDC maximum voltage (greater than the BA-5590)
    - Higher voltage has caused damage to some equipment.
  - When abused, the BA-5390 battery can ignite into a fire.
  - Energy capacity is severely degraded if exposed to high temperatures.
  - Above 190 degrees F, thermal switch will trip - rendering the battery useless.
- Equipment covered by approval:

AN/PRC-119A	AN/PRC-119C	AN/PRC-119D
AN/PRC-119F	AN/VRC-97A(88A)	AN/VRC-87C (88A)
AN/VRC-89A (91A)	AN/VRC-90A	AN/VRC-90C
AN/VRC-92A	RT-1523(B)	RT-1523 (C)
RCU C-11561 (C)		

Lithium Based Batteries

SAFETY REMINDER

SAFETY ALERT FOR 2590

LITHIUM RECHARGEABLE BATTERIES

- MARCORSYSCOM MSG 281516 Sept 01
- MARCORSYSCOM MSG 240921Z Apr 02
- **ALL LITHIUM BATTERIES** or products containing lithium batteries as backup power sources must be reviewed, tested and approved as directed under the Navy Lithium Battery Safety Program.
- BB-2590 batteries or power sources using BB-2590 batteries as an UPS device have not been approved for USMC applications.

MCCDC Battery Study

Task I

Identify End Items requiring batteries

Task II

Identify End Item quantities

Task III

Recommend Battery types & amounts

Task IV

Estimate Consumption Rates

- Hot
- Cold
- Temperate
- Storage

Task V

Develop Battery Prediction Tool

Estimated completion: Fall 2003

Battery Conservation Plan

Concept of Operations (Pending Marine Corps Order to be issued from HQ)

1. Reserve the use of primary batteries in equipment applications to those missions where they are the only practical option.
2. If Alternating Current (AC) power is available, either in garrison via facility power or in the field via generators, use AC energized power adapters, power supplies, or AC powered power sources/converters to power the equipment.
3. If Direct Current (DC) power is available, use DC energized power sources/converters to power the equipment.
4. If neither AC nor DC power is available, and the mission can be accomplished using secondary batteries (i.e., rechargeable batteries), then use rechargeable batteries. Depending on mission duration, recharging operations can be conducted during or after the mission.

commendation: Four rechargeable batteries for each battery in equipment power
he equipment, one for back up, one in transit to the equipment, and one on the o
Some units have successfully used a three to one ratio.

BA-8180 Zinc-Air Battery

- **Cooperative Effort with US Army Communications and Electronics Command (CECOM) and Marine Corps Warfighting Laboratory**
- **2d Marines, II MEF utilized ZINC-AIR power packs during CAX 9/10**
  - **Summer at 29 Palms California**
- **Worked on all tactical radios except EPLRS**
- **Ideal for retransmission sites**
- **Powered a PSC-5 net for four straight days**
- **One battery lasted 8 days on an Infantry Battalion Regimental TAC1 VHF net**
- **Longevity: consistently lasted 4-6 times the planned runtime of a BA-5590**
- **Weight Savings: Reduced battery carried load by ~ 40%**
- **Transmission Ratio: Volume of transmissions did not affect longevity of the battery**
- **Connections: Marines experimented with adaptors and found the battery easy to connect and use**

HAWKER ArmSafe+ Batteries

- Funding received in 2003 to procure HAWKER ARMASAFE PLUS (HASP)
- Procured & distributing 11,750 HASP batteries
- Provides a buffer to soften cost difference between existing 6TMF & HASP
- Being fielded to Tactical Wheeled Vehicle fleet community
- Any future funding will address other equipment / fleets
- Instructions issued via DMS:
  - MCSC 132130Z JAN 03,
  - MCSC 061812Z MAR 03,
  - MCSC 041437Z MAR 03,
  - MCSC 011430Z MAY 03

- BATTERY SAFETY ALERT & UPDATE issued f
- Program is conducting evaluation of performance between the 6T & HASP
- Evaluation will take place over a 36-month period

Battery Summary

- **HAWKER ARMASAFE PLUS batteries and 6T series batteries cannot be combined in the same application / on the same vehicle**
- **BA-5390 is only approved for Marine Corps use with SINCGARs**
- **The BB-2590 Lithium Ion is not yet approved for USMC use**
- **PP-8333 battery charger not programmed for the BB-2590 at this time**
- **ALL lithium batteries, to include backup power sources, must be reviewed, tested, and approved under the Navy Lithium Battery Safety Program.**
- **You nee when you purchas**

Having an NSN does not constitute being safety tested or being approved for use

Science and Technology Efforts

Science & Technology Efforts

- **Lightweight Generator Efforts**
  - **Lighter weight compared to current MEP-831 TQG**
  - **New concepts (to include fuel cells)**
  - **Incremental improvements**
  - **Reduced noise**
- **Hybrid system**
  - **Bigger than batteries**
  - **Smaller than TQG**
- **Alternative power sources**
  - **On-Board Power Generation**
  - **Solar Power Adaptors**
  - **Hybrid Electric Vehicles (Details at next session)**

Alternative Energy Conversion 50 - 500 Watts

ALTERNATIVES ADDRESSED:

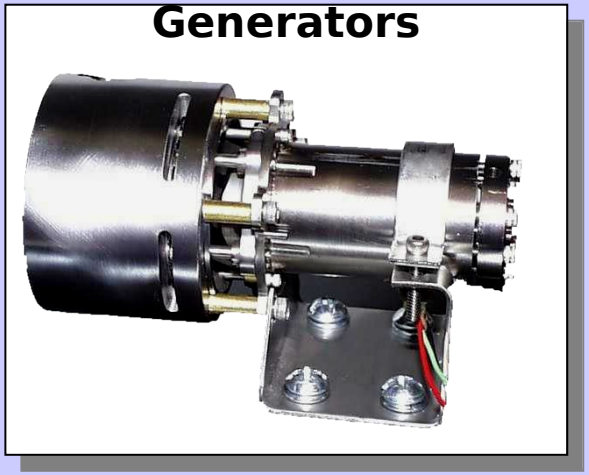
- Power derived from Human Activity
- Internal Combustion Engines
- External Combustion Engines
- Thermoelectrics
- Fuel Cells
- Thermo-Photo-Voltaics (TPV)

FINDINGS

- Fuel cells are most attractive (but JP-8 issue)
- TPVs being addressed under SBIR Program
- Stirling engine/linear alternator has tactical power niche up to the 100-W level
- Human power and thermo-electrics not viable
- High-speed miniature machinery has potential

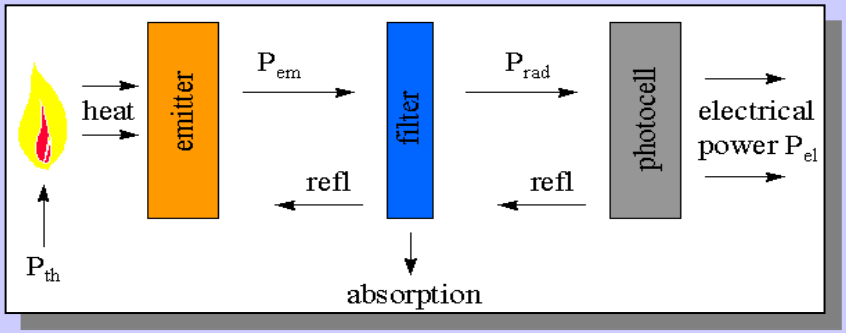
Power from Human Movement

Miniature Turbo Generators

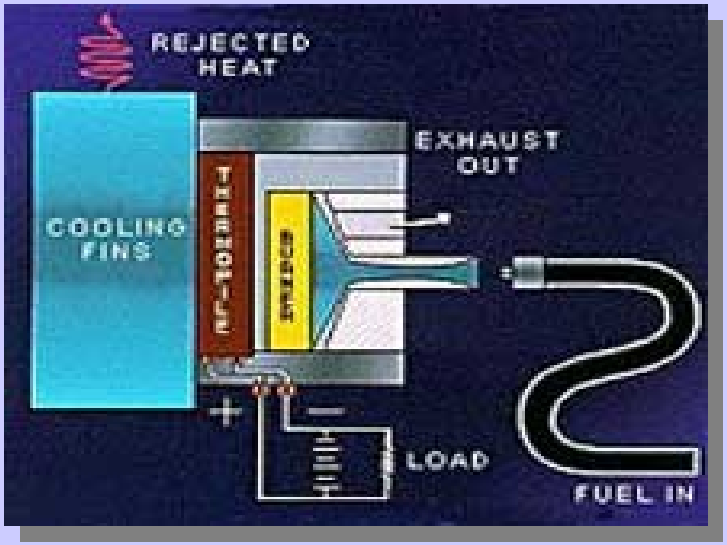


Alternative Comparison (3-kW size)

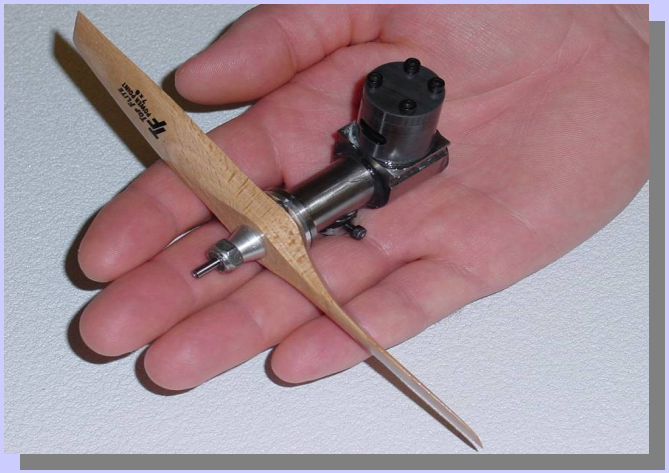
Thermophotovoltaic



Thermoelectric Generators



Internal Combustion Micro Diesel



Fuel Cells: 50- to 500-W Range

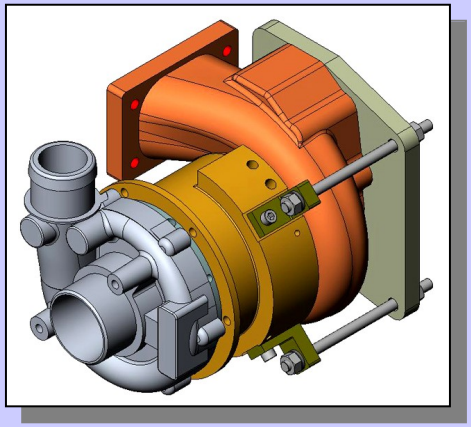
Alternative System Weight Comparison (3-kW TQG)

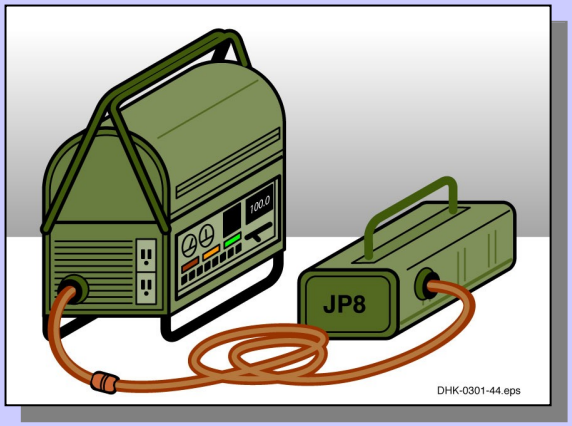
Generator Component	Current TQG	Light Wt. TQG	High RPM Diesel	High RPM Turbine	Fuel Cell (2kg/kW)	Stirling Engine
Battery	29.8	24	15	5	15	30
Engine	48.8	46	25	20	13.3	160
Balance of Plant	222.8	169.8	129.4	116.6	111.5	169.1
Fuel (8-hr Supply)	25	25	20	20	20	15.6
Total Weight	326.4	264.8	189.4	161.6	159.8	374.7
Weight Advantage vs. Current TQG	0	61.6	137	164.8	166.6	(48.3)
	$	$$	$$	$$$$	$$$	$$

Turbine Mini-Power System

Program Background

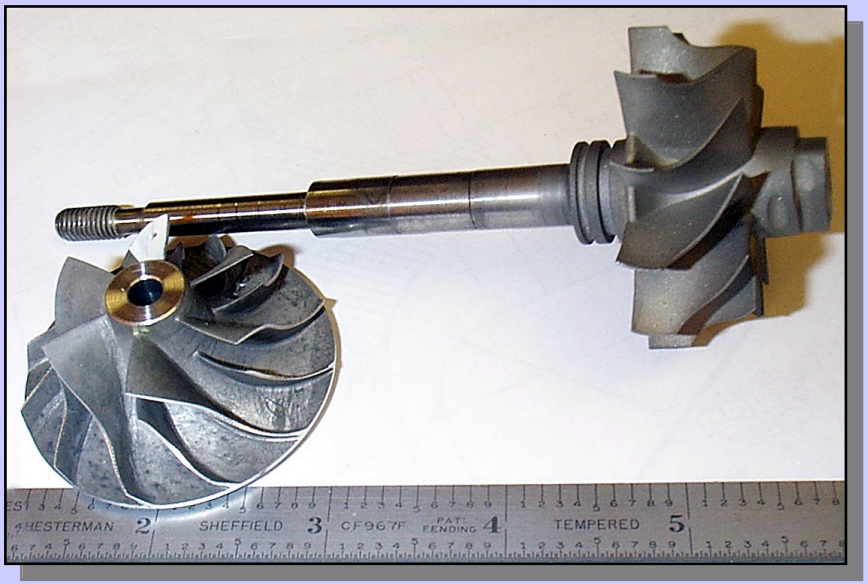
- Performer: Penn State Univ
- Principal: Dr. Daniel Kiely
- Sponsor: Office of Naval Research
- Start Date: 2003
- Complete: 2005
- Deliver: Working prototype





Technical Objectives

- Develop a compact, lightweight 3 kW mini-Brayton power source.
- Demonstrate system size, weight, and logistic fuel consumption goals in laboratory and field prototype tests.
- Develop supporting component technologies that allow scaling to greater power levels.



2 kW Ultra Lightweight Generator

Sponsor:
PM Intel Systems

Vendor:
Mainstream Engineering

Method:
Small Business Innovative Research (SBIR) Program

- Electrical Output Power: 2 kW
- Voltage: 28 VDC
- Size: 14”(L) x 11”(W) x 16”(H)
- Weight: 47 lbs
- Engine Characteristics
  - 4-stroke, Single cylinder
  - Air-Cooled
  - Naturally-aspirated
  - Compression-ignition
  - Shaft Power 2.8 kW
- Fuel:
  - Diesel
  - JP-5, JP-8, kerosene (reduced output)
  - 6 hr on-board fuel
- Interfaces:
  - Manual recoil starter
  - Voltmeter, ammeter, hour meter
  - Circuit Load Protection

Advanced Materials to Reduce System Weight and Signature

Program Background

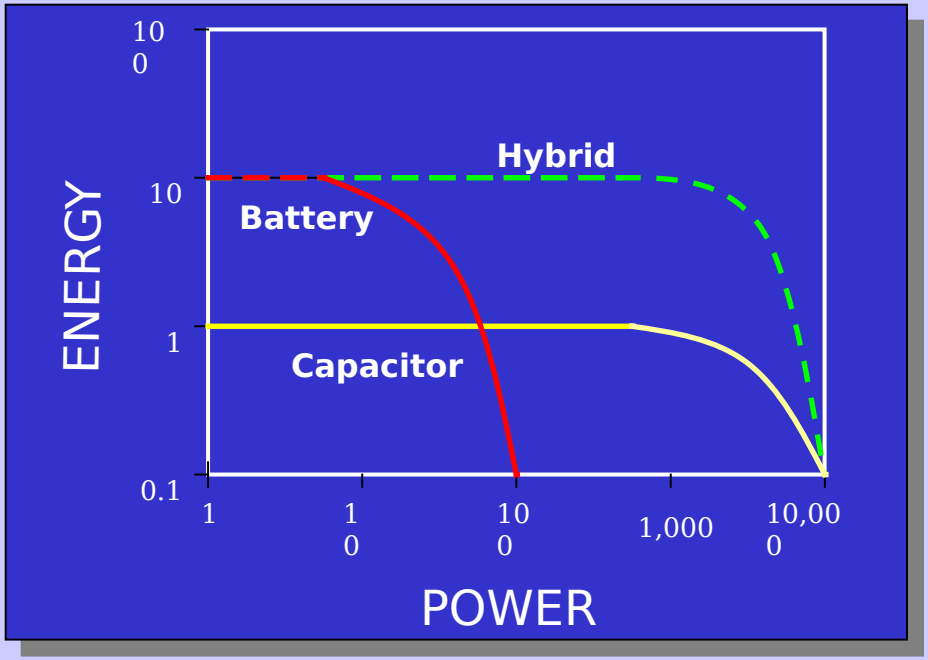
- **Performer: Pacific Northwest Nat'l Lab**
- **Principal: Mr. Chip Larson**
- **Sponsor: Office of Naval Research**
- **Start Date: 2002**
- **Completion: 2003**

- **Weight reduction of 36% realizable with composite materials**
- **Volume reduction of 31% possible with redesign on 3 kW TQG enclosure**
- **65 dBA maximum acoustic emission expected with redesigned exhaust**
- **IR signature reducible to <65°C with redesign & thermo-acoustic**

Hybrid Zn-Air / UltraCapacitor

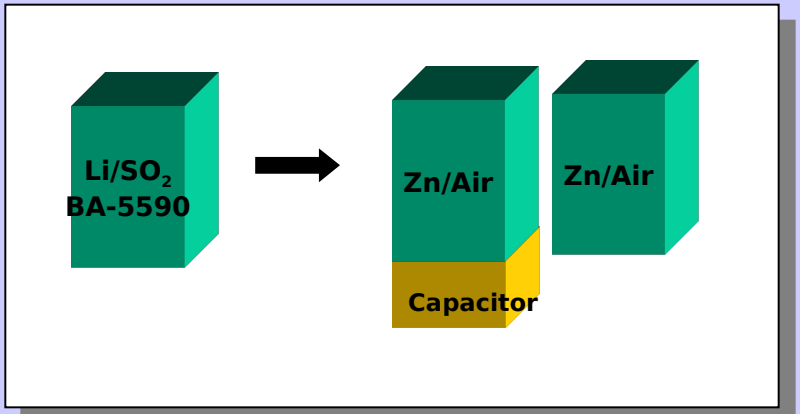
Program Background

- Performer: NSWC-Carderock
- Principal: Dr. Patricia Smith
- Sponsor: Office of Naval Research
- Start Date: 2003
- Completion: 2005
- Deliverable: Evaluation models

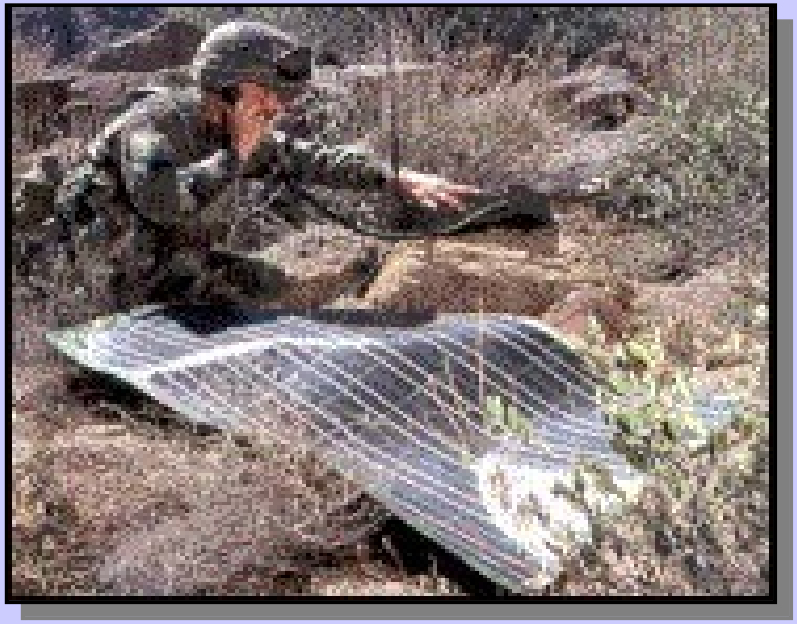


Technical Objectives

- Develop hybrid power supply
- Use modeling to guide decisions
- Employ zinc/air for high energy
- Employ ultra-capacitors for high power
- Modular System - Zn/Air switches out
- 30% Reduction in weight over BA-



Solar Power Adaptor



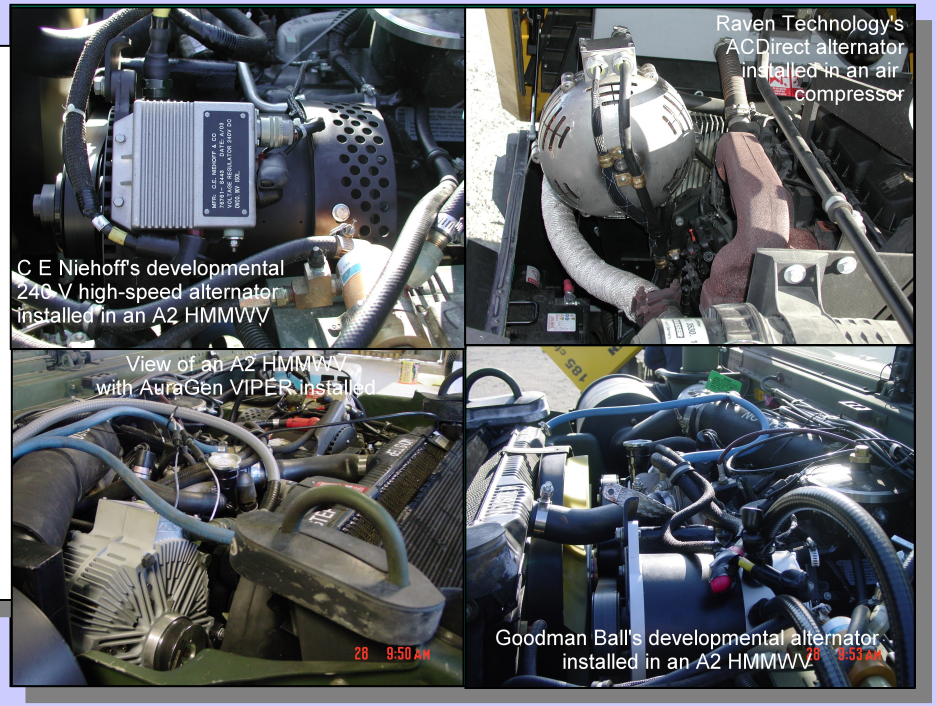
- Overarching Requirement
  - APSCE Program
  - Statement Of Need – staffing
- Must provide sufficient power for:
  - Radios
  - Computers
  - Charge batteries
- Experimentation in 2004
- Planned introduction 2006
- Quantities > 1,000
- Will undergo Operational Test & Evaluation

More Discussion Under Solar Power Session

On-Board Vehicle Power
Small Power

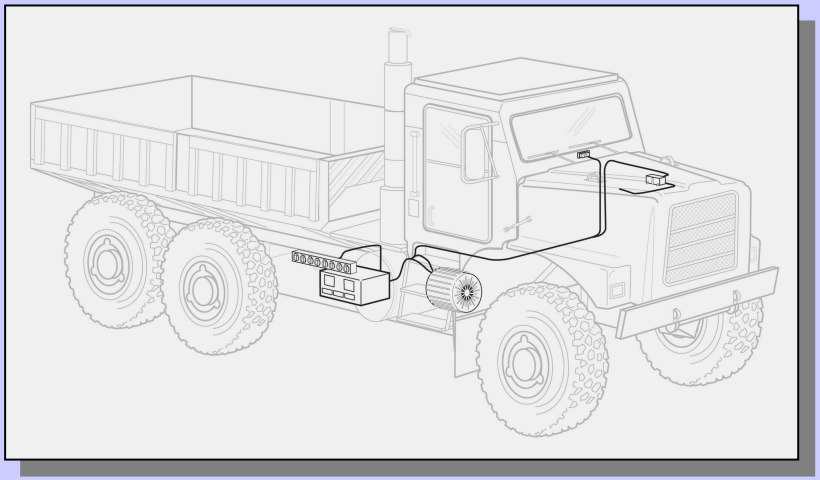
Program Background

- **Performer:** MTS / Army / USMC
- **Principal:** Mr. Jim Gough, MTS
- **Sponsor:** Office of Naval Research
- **Start Date:** 2002
- **Completion:** 2004
- **Deliverable:** COTS hardware


C E Niehoff's developmental 240 V high-speed alternator installed in an A2 HMMWV
Raven Technology's ACDirect alternator installed in an air compressor
View of an A2 HMMWV with AuraGen VIPER installed
Goodman Ball's developmental alternator installed in an A2 HMMWV

- **Current COTS: 5-8 kW, belt driven**
- **USMC - Army demonstration hosted in January 2003 at Quantico USMC base**
- **Pending requirement approval and funding - planned procurement in 2006**

On-Board Vehicle Power
Large Power



- 3 year effort – 2004 – 2006
- Competitive solicitation
- 3-prong approach (20, 30, 60 kW)
- HMMWV & MTVR platforms
- Deliver TRL 07 by 2006
- Platforms to be delivered for mission equipment integration

- Current vehicle generators provide single digit kilowatts
- Current COTS: 5-8 kW, belt driven
- Additional power will be needed for ***stationary systems*** that need to be ***expeditionary***
- Future vehicle systems need double digit capability

Need	Power	Time
Radars	30-60 kW	2007
CAC2S	13 kW	2006
UOC	21 kW	2005 (refresh)
NBC	12-20 kW	soon

ONR / DARPA Hybrid Electric RST-V

Hybrid Electric Drive System
- Fuel economy - 17 mpg
- 8 hours Silent watch
- 25 miles Silent movement
- Component distribution

In Hub Drive Motors
- Efficient space utilization
- Improved mobility
- Redundancy for fail-safe

Folding Suspension
- Minimize volume for helo
- Wide wheelbase for stability

Battery Energy Storage
- On-board power needs
- Off-board power needs

Program Accomplishments
- FY 97-98: Competitive Designs
- FY98-02: Build / Test 4 vehicles
- Participate in Warfighting experiments

Session

Lessons Learned

Power Systems Lessons

- **Big Power (Tactical Quiet Generators / Mobile Power Distribution)**
  - Worked as advertised, but users continue to want more power/generators
  - Sent tactical systems forward – leased/bought commercial units for rear
  - Power distribution units stretched thin – long lead items

- **Mobile Power (vehicle on-board APUs, inverters, battery chargers)**
  - Requests for more systems
  - Large opportunity for improvement and payoff

- **Batteries (one-time use batteries, rechargeable batteries, alternative power sources)**
  - Will never be "one size fits all"
  - Have to provide options

Commercial Generator Buy

- Urgent Requirement received from Iraq
- Existing TQGs unavailable to meet need
- Diesel / JP-8 fuel compatible
- Provides at least 15 kilowatts electrical power
- Less than 2000 pounds wet weight
- Delivery AS SOON AS POSSIBLE

- 35 commercial electrical generators
- 3 Bids solicited and received
- Contract Award: Magnum Products LLC
- CONUS delivery in 7 days
- 6 months consumable parts block
- One - time buy / Non-Std waiver granted

MEP Distribution (MEPDIS)

- USMC currently employ MEPDIS
- Similar to Army PDICE
- Long lead-time, expensive
- Planning now for future MEPDIS
- Developed, tested and fielded 5 kW Power Distribution System (PDS) for Forwa Resuscitative Surgical Suite (FRSS) preparation for Iraqi Liberation
- Commercial components, NEMA 4 capability
- 30% of the cost of MEPDIS / PDICE
- E-MEPDIS developed under SBIR a
  - Deployed to Iraq
  - Lessons not received back yet

Business Opportunity Initiatives

Floodlight Replacement System

- **2002 Program Initiation (money deferred)**
- **Prototypes being tested in FY03 and FY04**
- **Acquisition Policy / Adequate Competition support:**
  - **Federal purchase schedule preference**
  - **COTS / NDI preference**
- **2005 or 2006 program restart anticipated**

Solicitation & Procurement will be Rapid Turn-Around

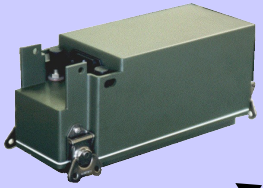
Acquisition Strategy

- Fully commercial or modified commercial item
- FedBizOpps announcement & solicitation
- Submission of proposal with Bid Sample
- Selection based on proposal & bid sample findings
- Production testing (single vendor, 2-5 units)
- Full Quantity Buy / Production / Fielding
- Warranty & World Wide Support will be required

ADVANCED POWER SYSTEMS FOR COMMUNICATIONS EQUIPMENT

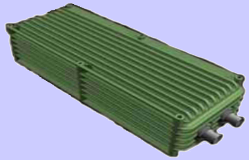
Multi-SINCGARS Power Adaptor

Single SINCGARS Power Adaptor



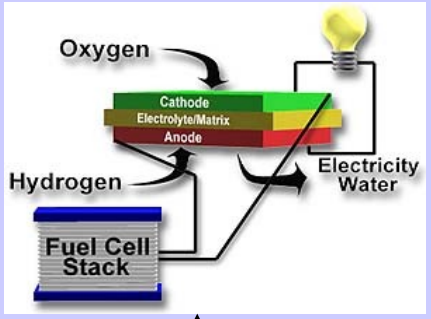
Radio Power Adaptors

Power Converters



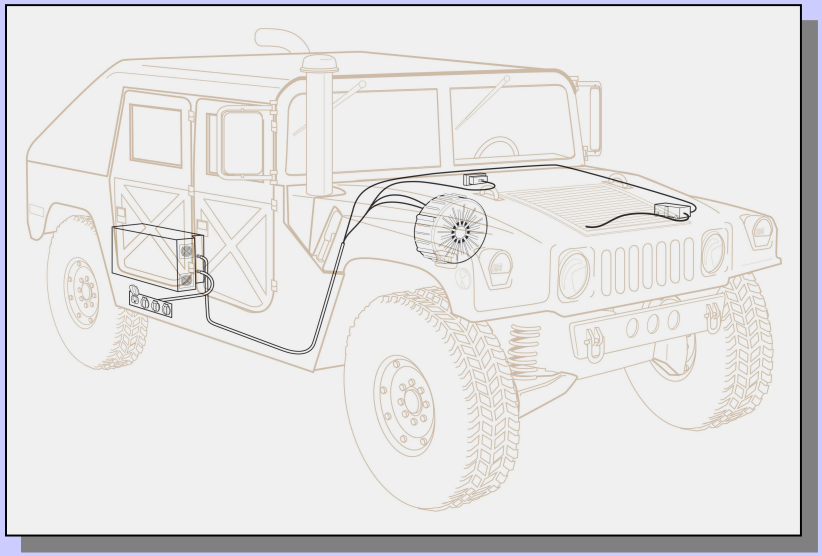
Solar Power

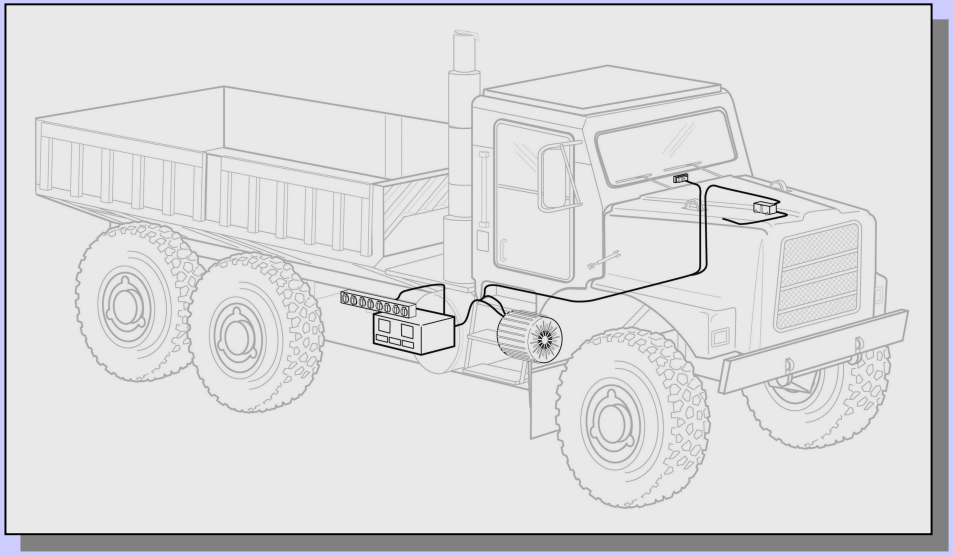
Fuel Cells



FY02 **FY03** **FY04** **FY05** **FY06** **FY07**

On-Board Vehicle Power Generation





Program Plan – Large Power Systems – ONR Lead

- **Competitive solicitation – 2004**
- **Design / Fabricate / Test – 2005-2007**
- **3-prong approach (20, 30, 60 kW)**
- **HMMWV & MTVR platforms**
- **Deliver Technology Readiness Level TRL 07**
- **Follow-on equipment integration on platforms**

Points of Contact

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- **ONR (6.3) Science & Tech Mr. Mike Byerly Michael_Byerly@onr.navy.mil**
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- **MTS On-Board Power Mr. Jim Gough goughj@mtstech.com**
- **PNNL Advanced Tech Mr. Chip Larson Chip.Larson@pnl.gov**

Questions & Answers